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Abstract

SINTERED FUEL OF HIGH DENSITY OBTAINED BY "METALLIC GRADE" UO_2 POWDER CHARACTERIZED BY SEDIMENTATION ANALYSIS REGARDLESS OF ORTHOKINETIC FLOCCULATION

by

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Ceramic fuel containing sintered uranium dioxide is normally obtained from "ceramic grade" UO_2 powder. Our trends have been directed towards obtaining this fuel from the "metallic grade" UO_2 powder, although this method is unusual. The characteristics of uranium dioxide powder have been therefore determined by sedimentation analysis and at the same time the influence of flocculation on the values of characteristic parameters of the powder observed. It has been attempted to define a parameter characterizing the powder which is independent of experimental conditions. In accordance with our earlier theoretical and experimental work it has been shown that this characteristic value can be also found in this particular case. The weight mean diameter of uranium dioxide is linearly dependent on concentration and can be extrapolated to zero from which the characteristic parameter of the powder is defined.

An analysis of the experimental results also indicates that orthokinetic flocculation of the uranium dioxide investigated is not particularly pronounced in some metal powders.

Investigations of the "metallic grade" uranium dioxide powder by the differential thermal analysis method have shown that its fraction below 60 microns has a characteristic temperature difference of 158°. This indicates that it belongs to the group of sinterable powders which have been proved by simultaneous investigations of the sintering of "metallic grade" uranium dioxide powder prior to fractionation and of the separated fraction.

By sintering the "metallic grade" uranium dioxide powder whose agglomerates are below 60 microns in an atmosphere of water vapor or carbon dioxide at 1300° densities up to 96% of theoretical values can be obtained. This indicates that high density sintered fuels can be easily obtained from "metallic grade" uranium. The characteristic fracture through grains and the adequate grain size have been observed by fracture surface and microscopic studies.